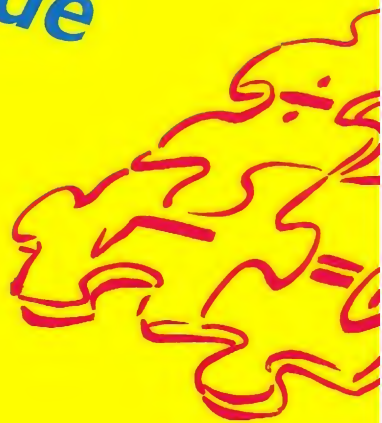




The Sciences **Good Study Guide**



*Andrew Northedge,
Jeff Thomas, Andrew Lane
and Alice Peasgood*

The Sciences Good Study Guide



The Sciences Good Study Guide is indispensable for students of mathematics, science, technology and engineering. Packed with practical exercises and activities, it aims to make studying more enjoyable and rewarding. It's an invaluable source of 'hints and tips', helping you to learn more effectively and develop study strategies that really work.

The book is designed to meet the needs of a range of learners – not just those involved in distance education. It will appeal to beginning and experienced students alike, including those:

- starting to study at college or university
- taking access/study skills courses
- looking afresh at how they study.

Like no other book, *The Sciences Good Study Guide* offers you:

- opportunities to practise key study skills
- a Maths Help section
- guidance on how to approach practical work
- advice on how to manage your precious study time
- hints on how a computer can help you study.

The book starts from real-life situations and encourages you to build on familiar skills.

The Sciences Good Study Guide is based on feedback from students of The Open University and the university's extensive experience of teaching science, technology, mathematics and computing.

Comments on *The Sciences Good Study Guide* from experienced study skills teachers:

'Read it, work through it, and give serious consideration to the advice it offers – I defy you not to emerge a more effective learner.'

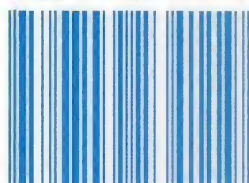
'The book is conceived to help students in a non-pompous and friendly way – it certainly succeeds. I wish it had been available to me as a student.'

'It will surely become the standard text for the numerous access/foundation year courses in FE and HE institutions.'

This is a set book for The Open University Science Foundation Course S103 *Discovering Science* and the second level course S280 *Science Matters*.

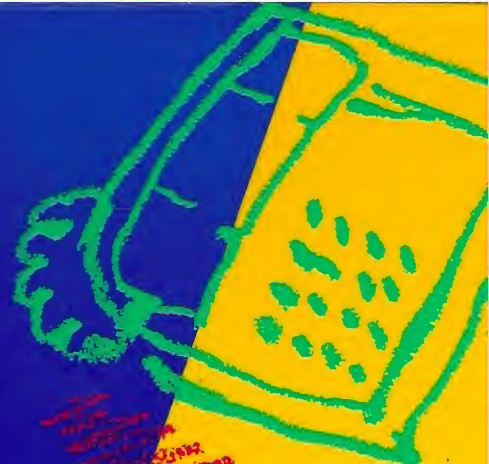



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The Good Study Guide



Andrew Northedge





The Good Study Guide

Studying is one of the most challenging activities and one of the most satisfying; indeed it can change your life. But if you take the wrong approach it can be frustrating and disappointing. Whether you are new to study or more experienced, *The Good Study Guide* will improve your study skills by helping you to:

- read with concentration and understanding
- write fluently and forcefully
- develop a flexible note-taking strategy
- handle numbers confidently
- prepare effectively for exams.

The Good Study Guide can be used either as an *introductory workbook*, or as a *reference book* to help you refine your study technique. Using real-life examples and practical exercises, it is designed to meet the needs of social science and humanities students, including adults studying part-time, and anyone returning to study, perhaps after a long break. Students on access/ study skills courses will find it invaluable. It is a set book for the Open University Social Science Foundation Course.

Comments on *The Good Study Guide* from experienced study skills teachers:

'It is extremely readable in style and presentation, easily accessible to the less able student ... I just wish someone had given me this material when I started university! In fact I think I could still learn from it ...'

'It is truly a compulsively good read ... a beautifully crafted, customer-friendly, superb catalogue of really helpful advice.'

OPEN UNIVERSITY SET BOOK

ISBN 0-7492-0044-8



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SCIENCE DATA BOOK

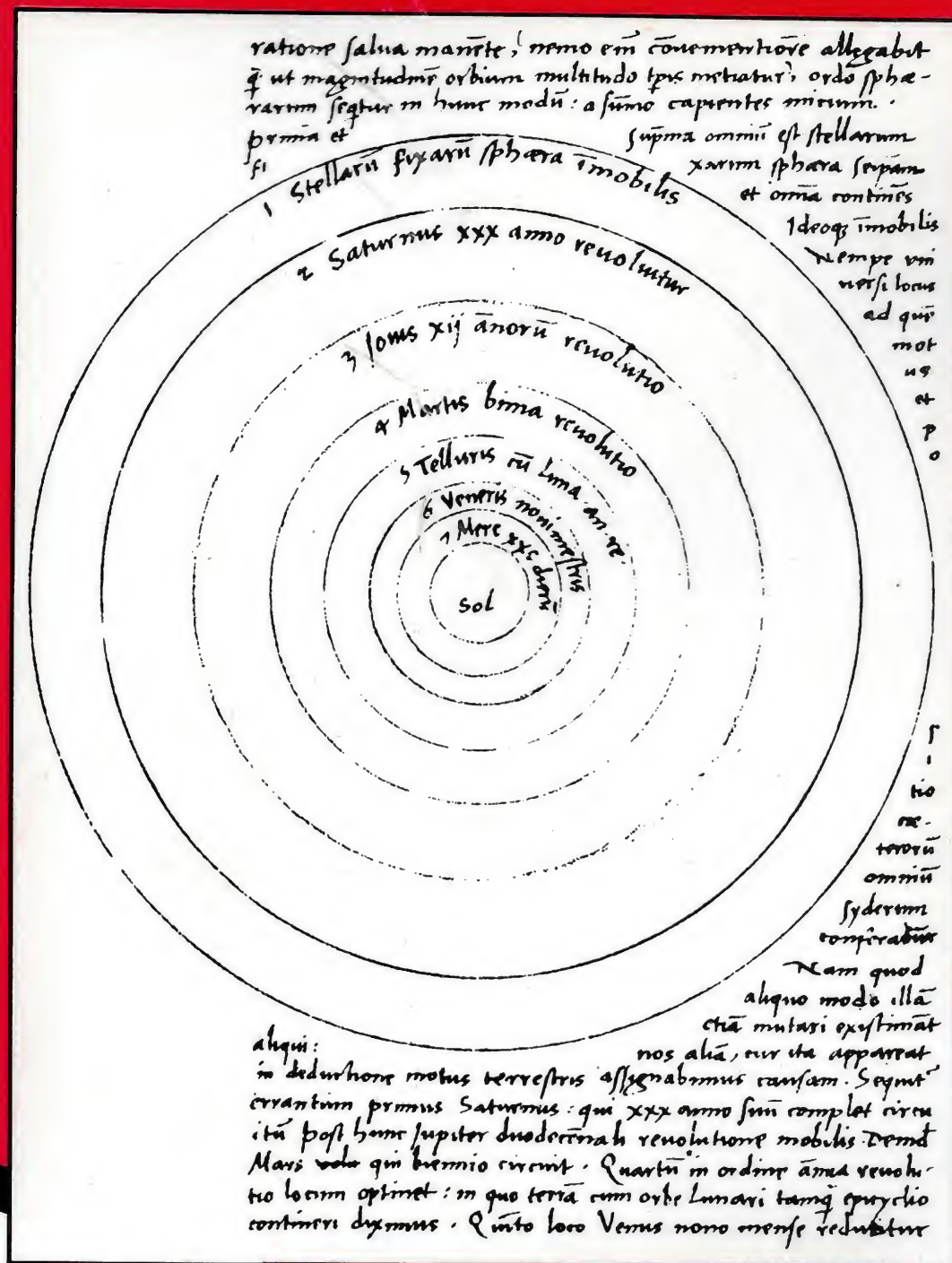
Edited by
R.M. Tennent

SET BOOK



Oliver & Boyd

SCIENCE

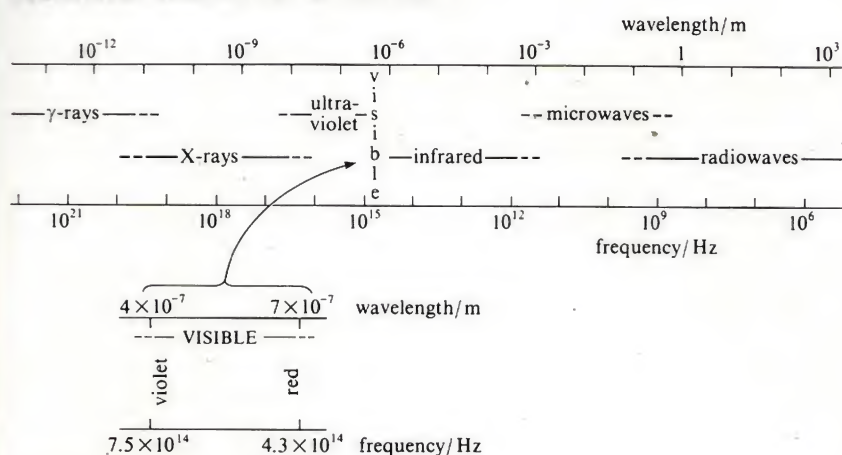


Unit 1
Science and the planet Earth

Unit 2
Measuring the Solar System

USEFUL INFORMATION FOR THE PHYSICS AND GENERAL SCIENCE UNITS

ELECTROMAGNETIC SPECTRUM



PHYSICAL CONSTANTS

Symbol	Quantity	Approximate value
G	gravitational constant	$6.672 \times 10^{-11} \text{ N m}^2 \text{ kg}^{-2}$
c	speed of light in a vacuum	$2.998 \times 10^8 \text{ m s}^{-1}$
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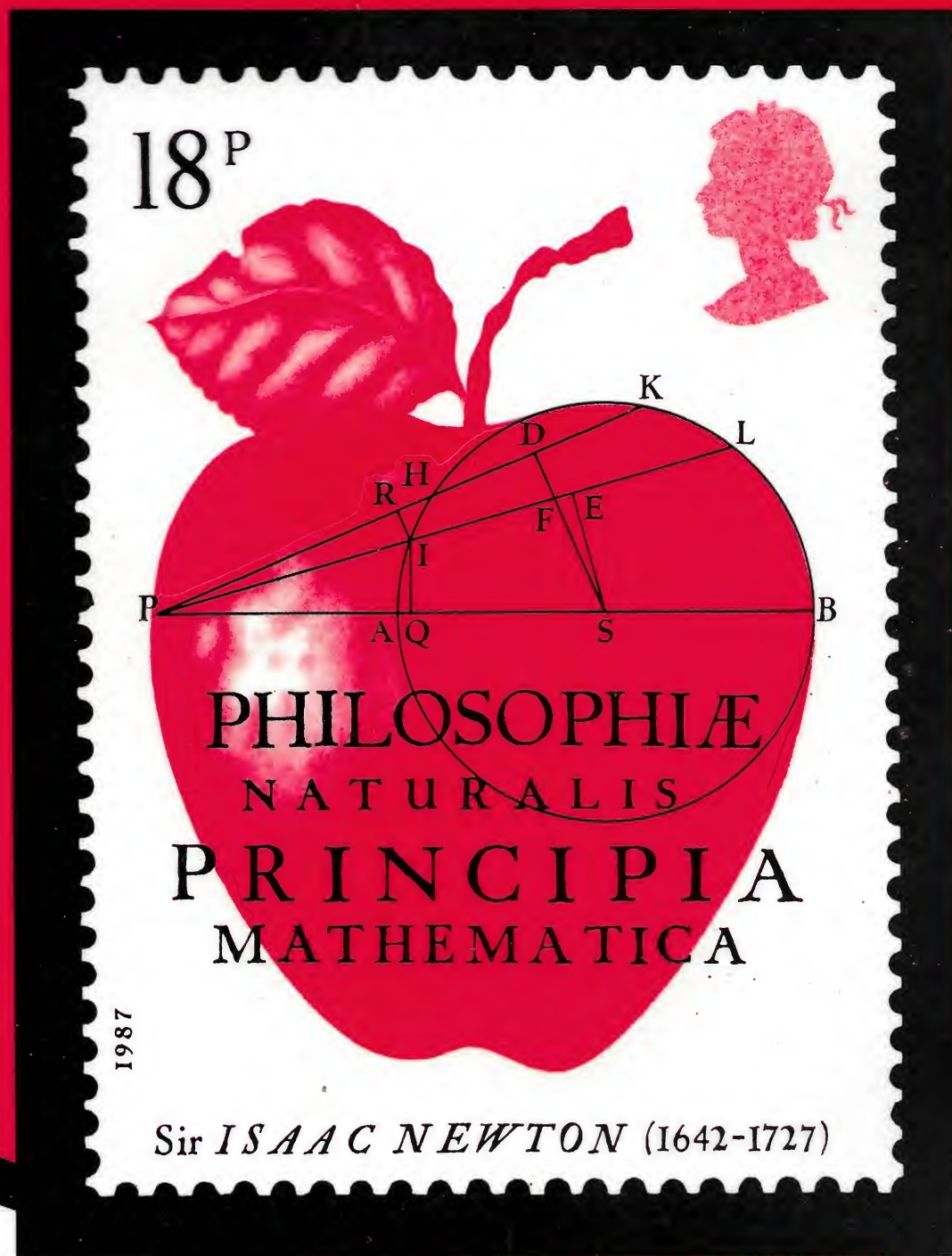
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SI02 UNITS

1	Science and the planet Earth	19	Life and evolution
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SCIENCE

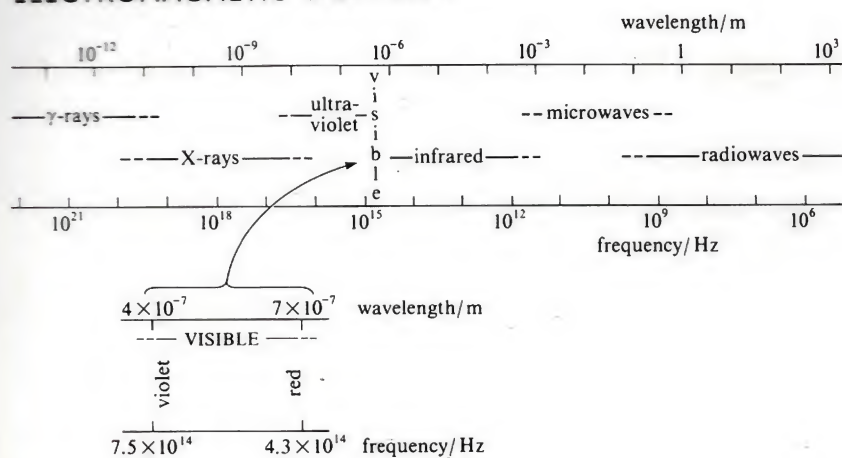


Unit 3
Motion under gravity

Unit 4
Practical work in science

USEFUL INFORMATION FOR THE PHYSICS AND GENERAL SCIENCE UNITS

ELECTROMAGNETIC SPECTRUM



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USEFUL QUANTITIES AND CONVERSIONS

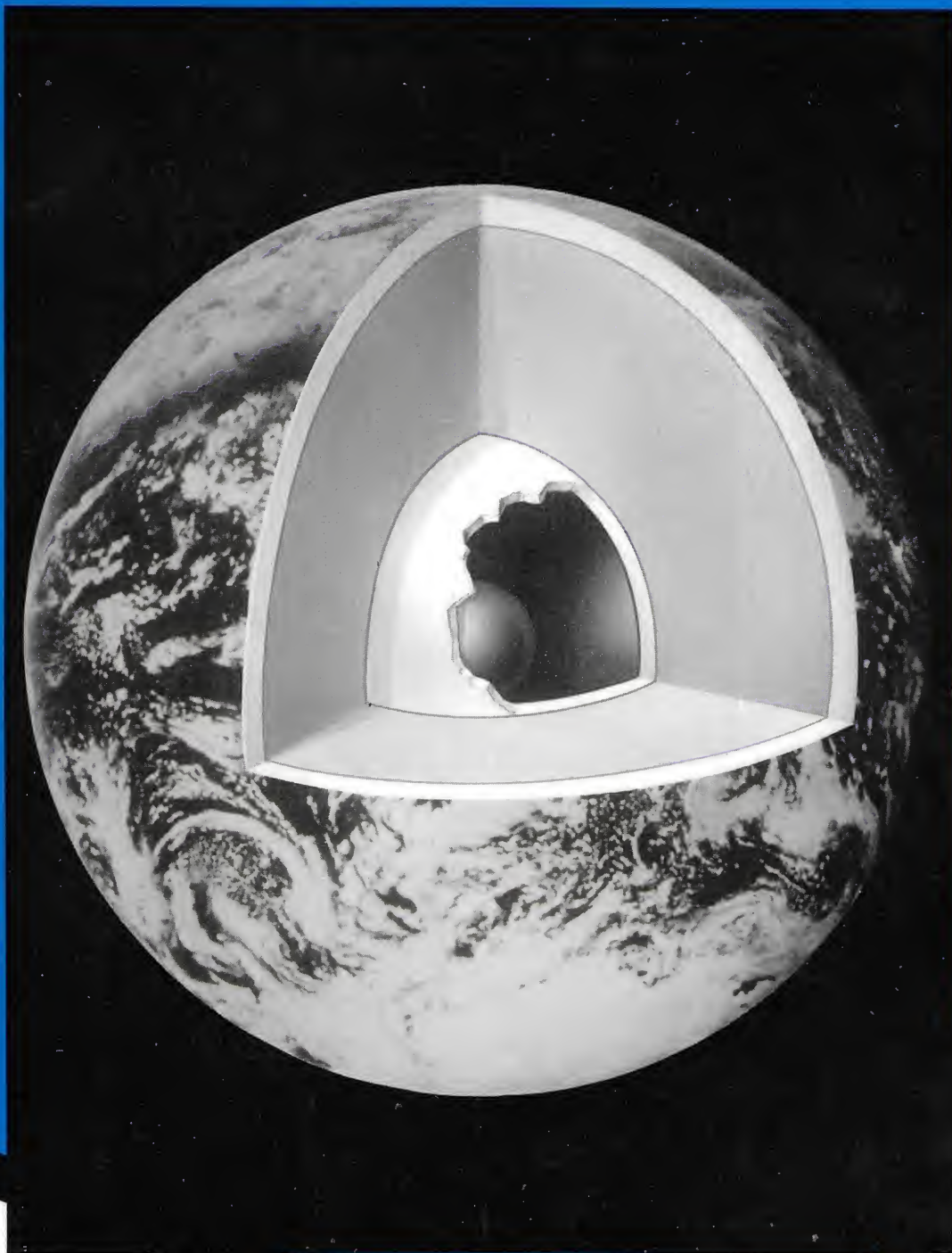
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17-18	The chemistry of carbon compounds	32	The search for fundamental particles

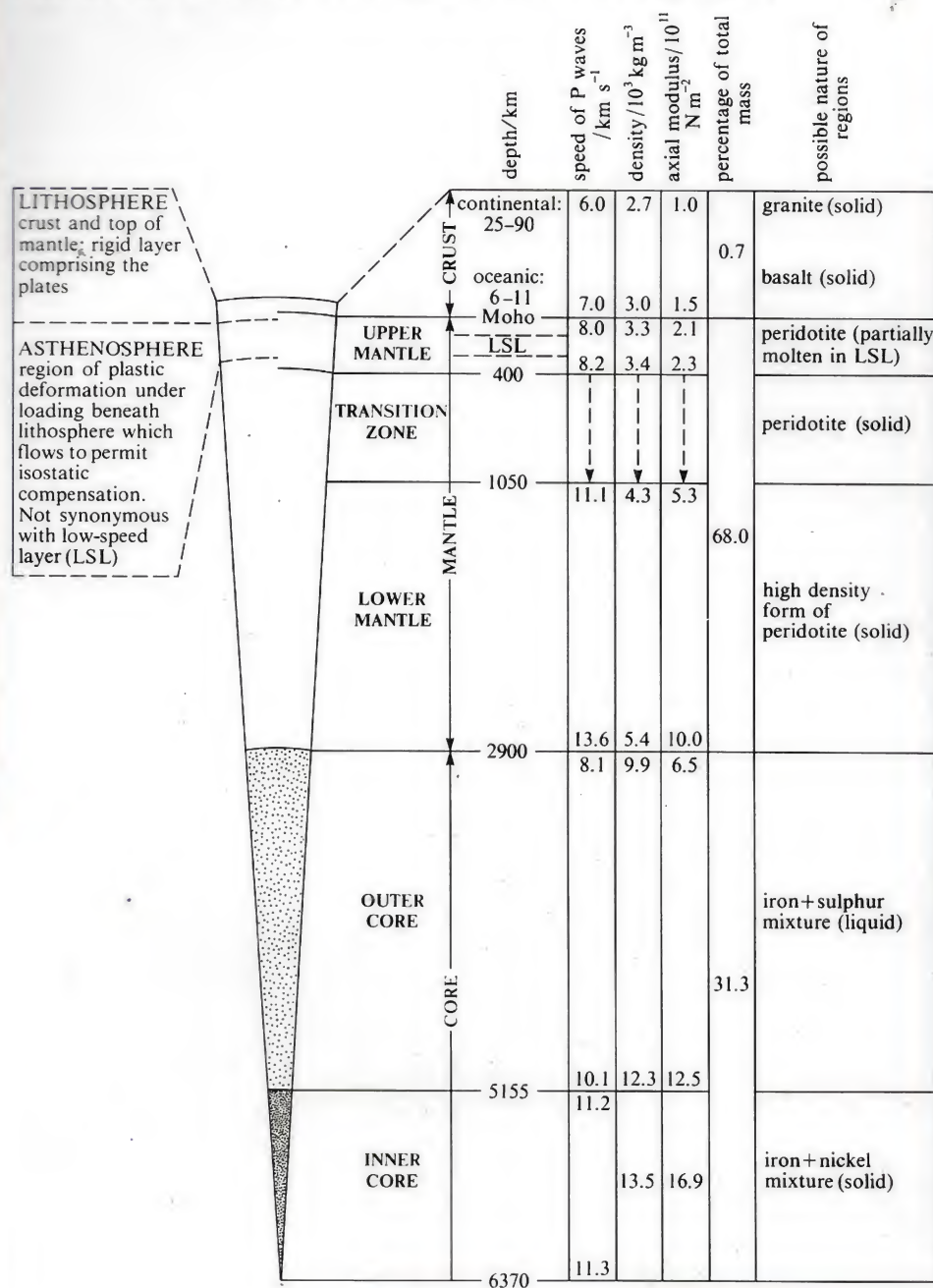


SCIENCE



Units 5-6
Into the Earth: earthquakes,
seismology and the Earth's magnetism

PROPERTIES OF THE EARTH'S INTERIOR



SI02 UNITS

- | | |
|---|---|
| 1 Science and the planet Earth | 19 Life and evolution |
| 2 Measuring the Solar System | 20 Inheritance and cell division |
| 3 Motion under gravity | 21 Genes and evolution |
| 4 Practical work in science | 22 Biochemistry |
| 5-6 Into the Earth: earthquakes, seismology and the Earth's magnetism | 23 Physiology |
| 7-8 Plate tectonics: a revolution in the Earth sciences | 24 DNA: molecular aspects of genetics |
| 9 Energy | 25 Ecology |
| 10 Modelling the behaviour of light | 26 Biology reviewed |
| 11-12 Atomic structure | 27 Earth materials and processes |
| 13-14 Chemical reactions and the Periodic Table | 28-29 Geological time and Earth history |
| 15 Chemical equilibrium | 30 Quantum mechanics: an introduction |
| 16 Chemical energetics | 31 Quantum mechanics: atoms and nuclei |
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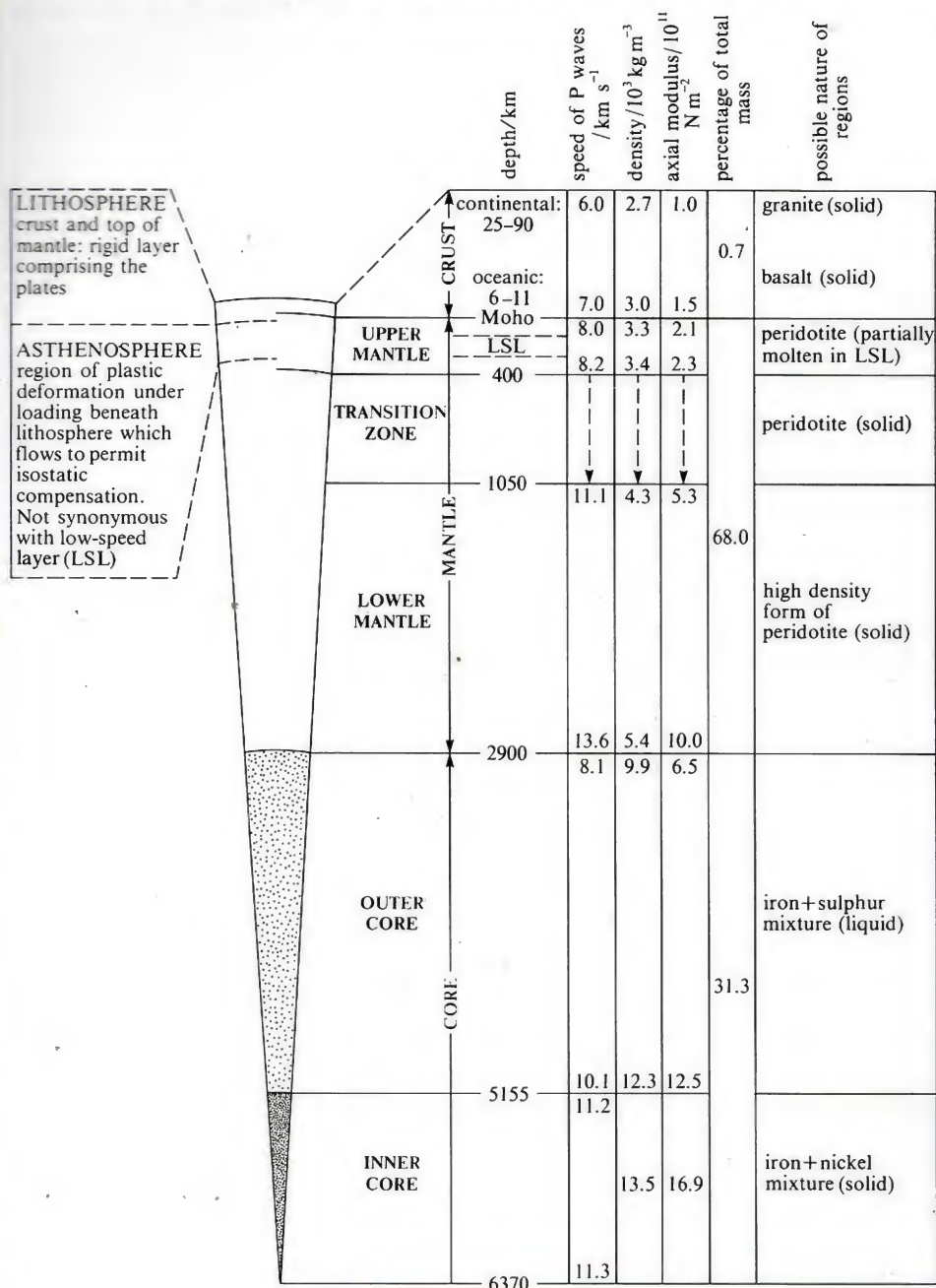


SCIENCE



Units 7-8
Plate tectonics:
a revolution in the Earth sciences

PROPERTIES OF THE EARTH'S INTERIOR



5102 UNITS

- | | |
|---|---|
| 1 Science and the planet Earth | 19 Life and evolution |
| 2 Measuring the Solar System | 20 Inheritance and cell division |
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SCIENCE

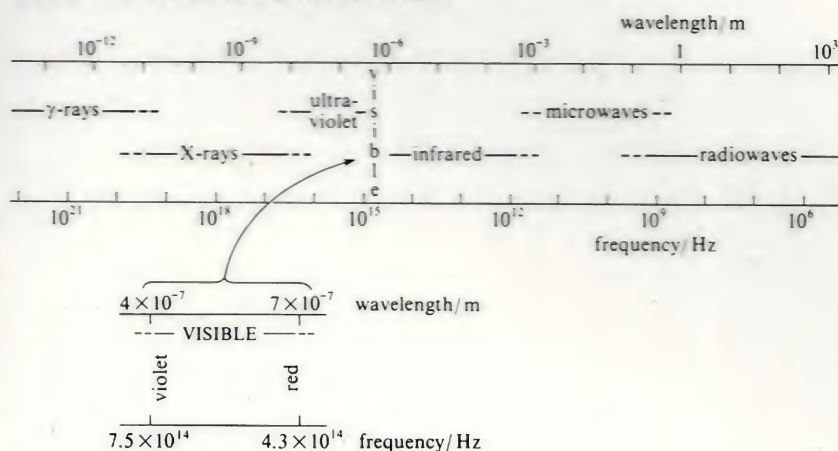


Unit 9
Energy

Unit 10
Modelling the behaviour of light

USEFUL INFORMATION FOR THE PHYSICS AND GENERAL SCIENCE UNITS

ELECTROMAGNETIC SPECTRUM



PHYSICAL CONSTANTS

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S102 UNITS

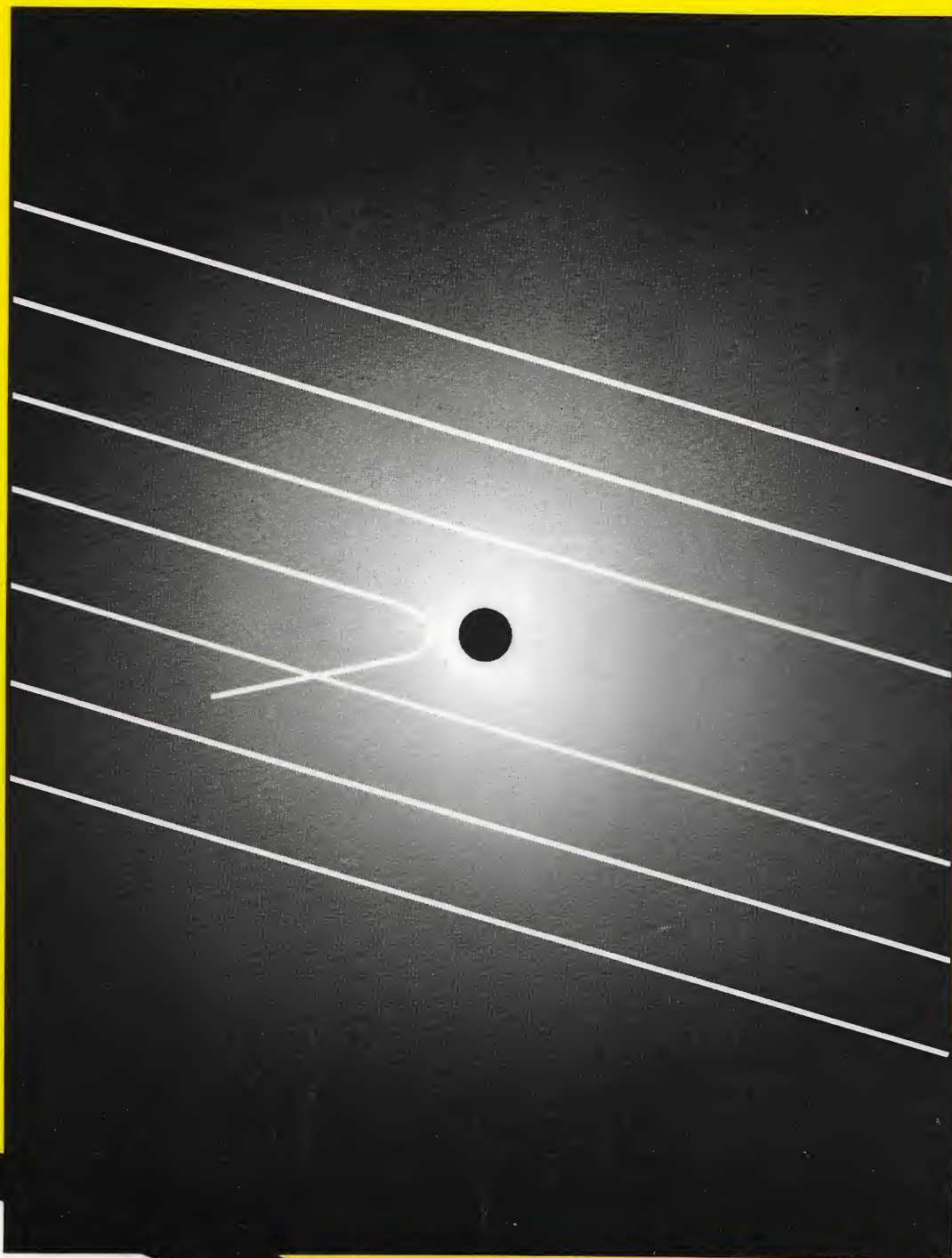
1 Science and the planet Earth	19 Life and evolution
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SI02 UNITS 11-12

THE OPEN UNIVERSITY
SI02: A SCIENCE FOUNDATION COURSE



SCIENCE



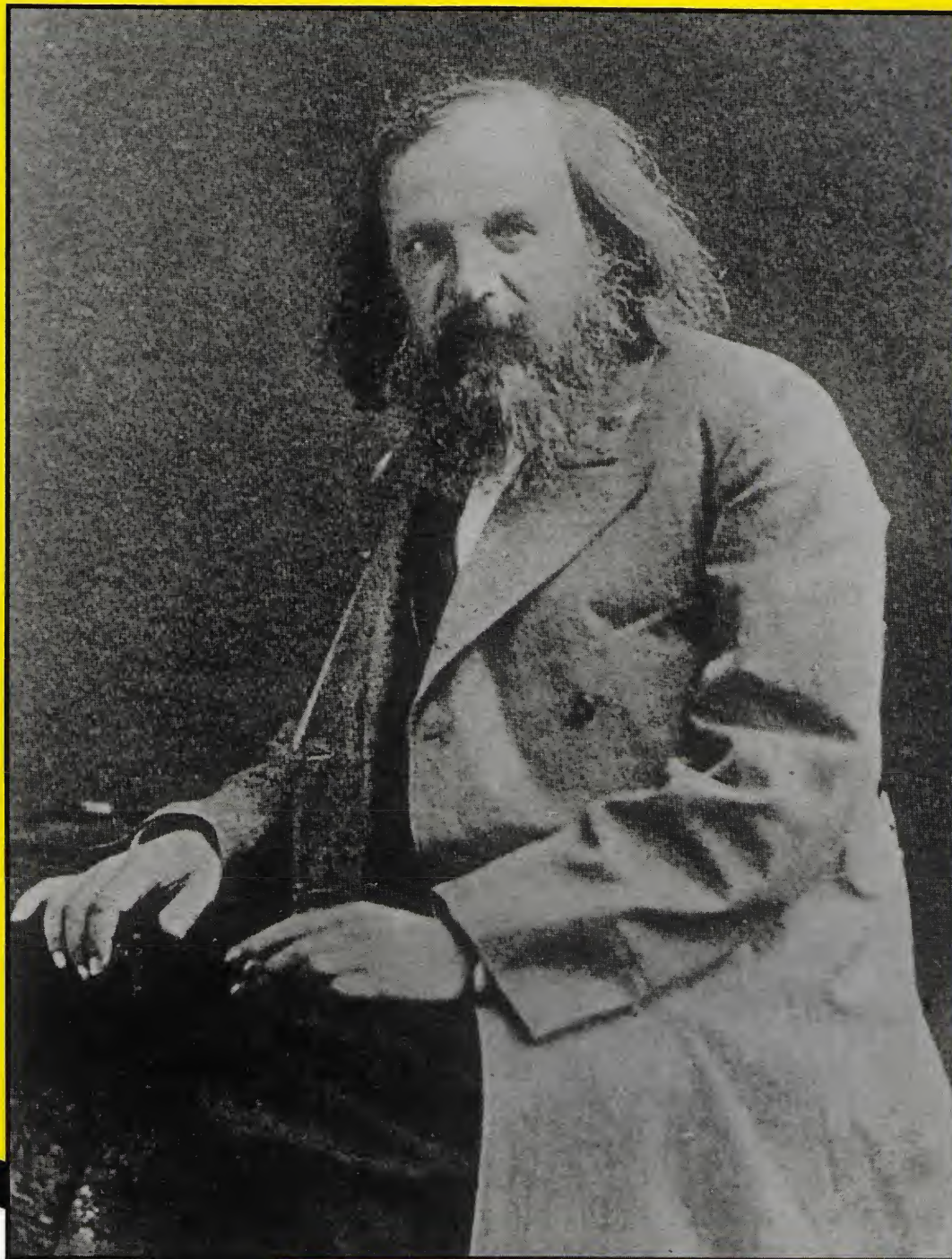
Units 11-12
Atomic structure

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1	Science and the planet Earth	19	Life and evolution
2	Measuring the Solar System	20	Inheritance and cell division
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SCIENCE



Units 13-14
Chemical reactions
and the Periodic Table



SCIENCE



Unit 15
Chemical equilibrium

Unit 16
Chemical energetics

THE PERIODIC TABLE

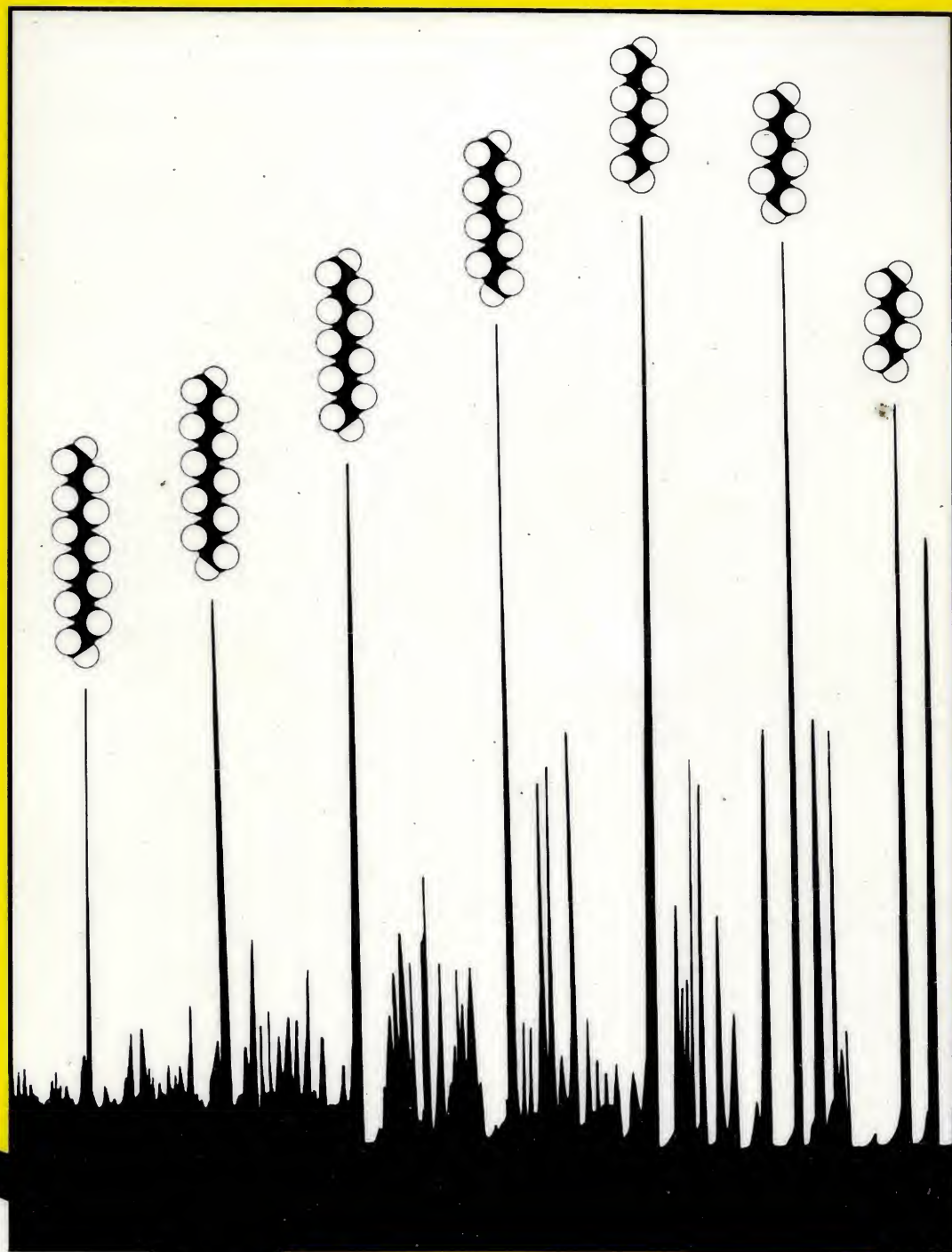
1 H																	2 He																
3 Li	4 Be																	5 B	6 C	7 N	8 O	9 F	10 Ne										
11 Na	12 Mg																	13 Al	14 Si	15 P	16 S	17 Cl	18 Ar										
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr																
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe																
55 Cs	56 Ba	57-70 lanthanides																71 Lu	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
87 Fr	88 Ra	89-102 actinides																103 Lr	104	105													
																		transition elements															
																		typical elements															
																		lanthanides															
		57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb																		
		89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No																		
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SCIENCE



Units 17-18
The chemistry of
carbon compounds

SI02 UNITS 19, 20 AND 21

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SI02: A SCIENCE FOUNDATION COURSE



SCIENCE



Unit 19
Life and evolution

Unit 20
Inheritance and cell division

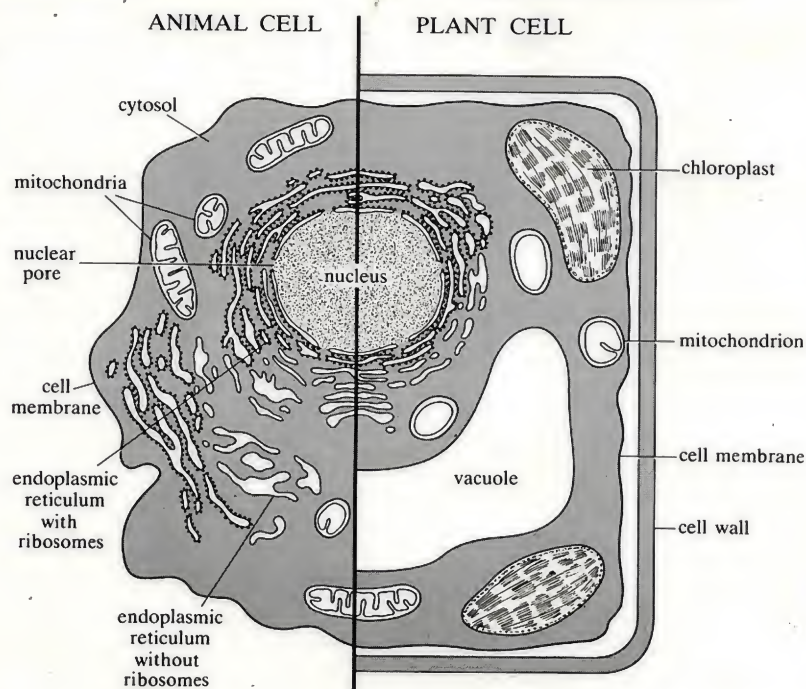
Unit 21
Genes and evolution

USEFUL INFORMATION FOR THE BIOLOGY UNITS: CHEMICALS, CELLS AND CLASSIFICATION

All cellular organisms contain these four biopolymers (made up of the monomers shown below).

Biopolymers:	polysaccharides	proteins	DNA	RNA
Monomers:	monosaccharides	amino acids	deoxyribonucleotides	ribonucleotides

All eukaryotic organisms have cells of the following generalized structure.



All living organisms can be divided into four kingdoms. The figures in brackets show the number of species (in thousands) in each subkingdom.

Animals	Plants	Fungi	Prokaryotes
sponges (4)	eukaryotic algae (20)	slime moulds (0.5)	bacteria (1.6)
unicells (40)	true plants (330)	true fungi (100)	blue-green bacteria
multicells			(formerly termed blue-green algae).
(1 000–2 000)			(1.5)

SI02 UNITS

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SI02 UNITS 22 AND 23

THE OPEN UNIVERSITY
SI02: A SCIENCE FOUNDATION COURSE



SCIENCE



Unit 22
Biochemistry

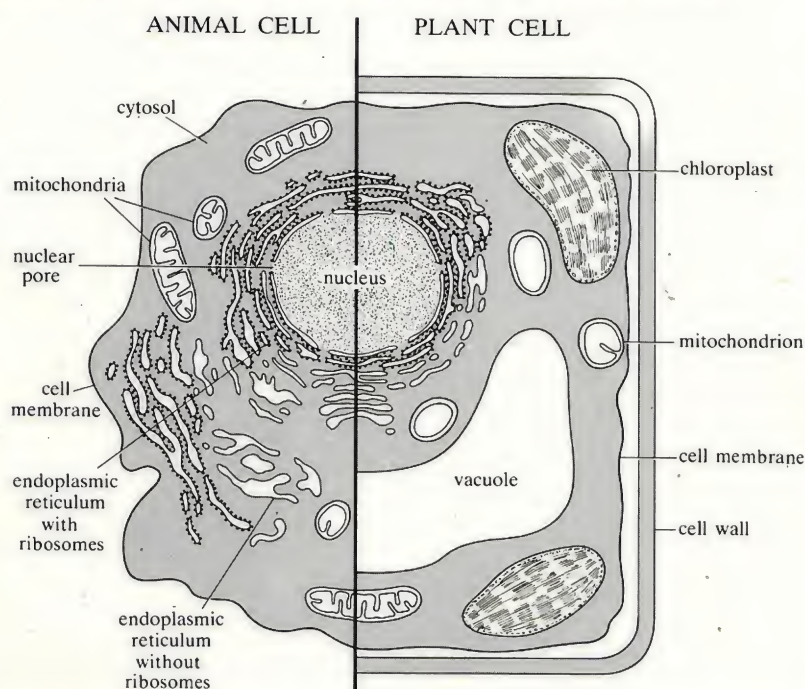
Unit 23
Physiology

USEFUL INFORMATION FOR THE BIOLOGY UNITS: CHEMICALS, CELLS AND CLASSIFICATION

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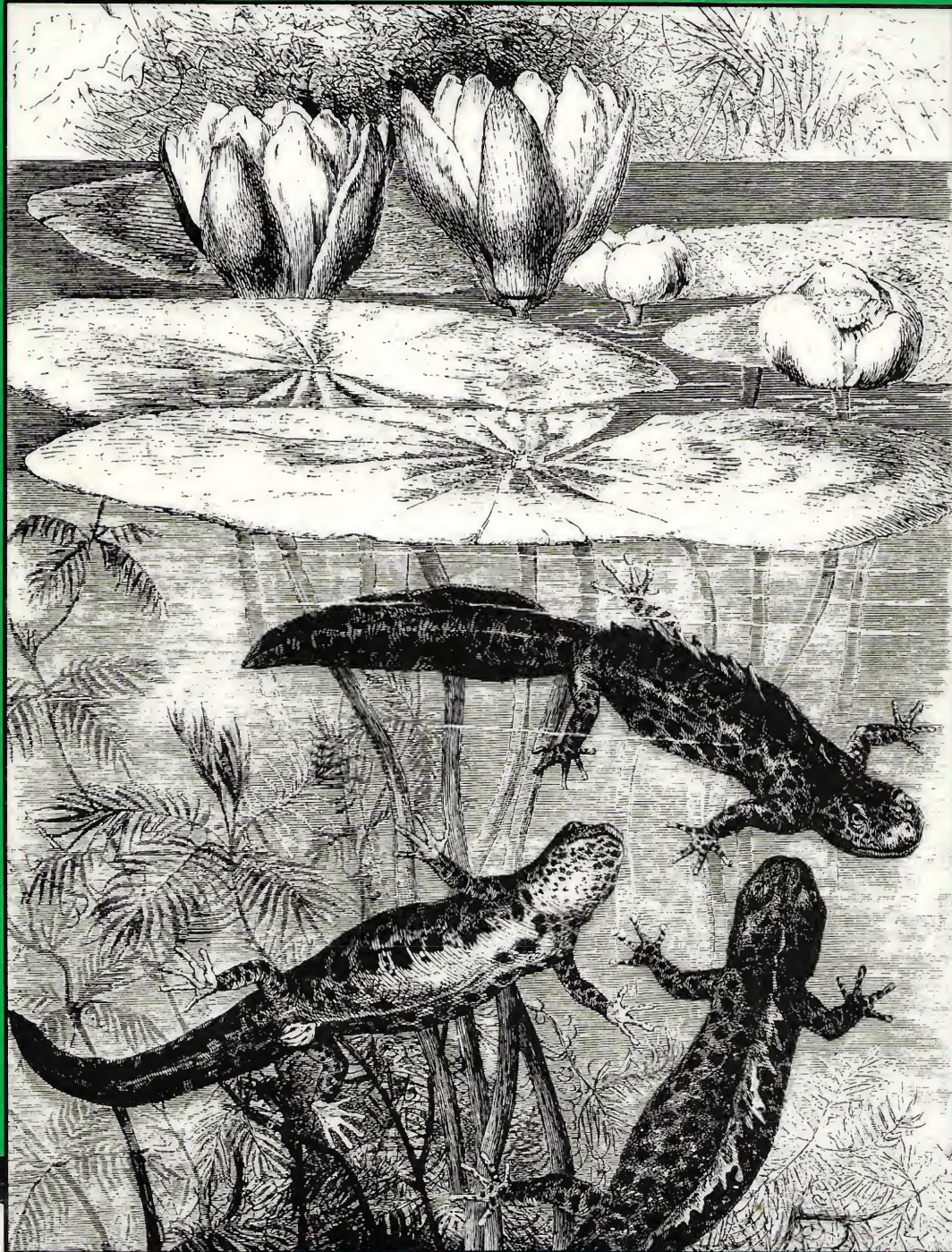
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SCIENCE



Unit 24
DNA: molecular
aspects of genetics

Unit 25
Ecology

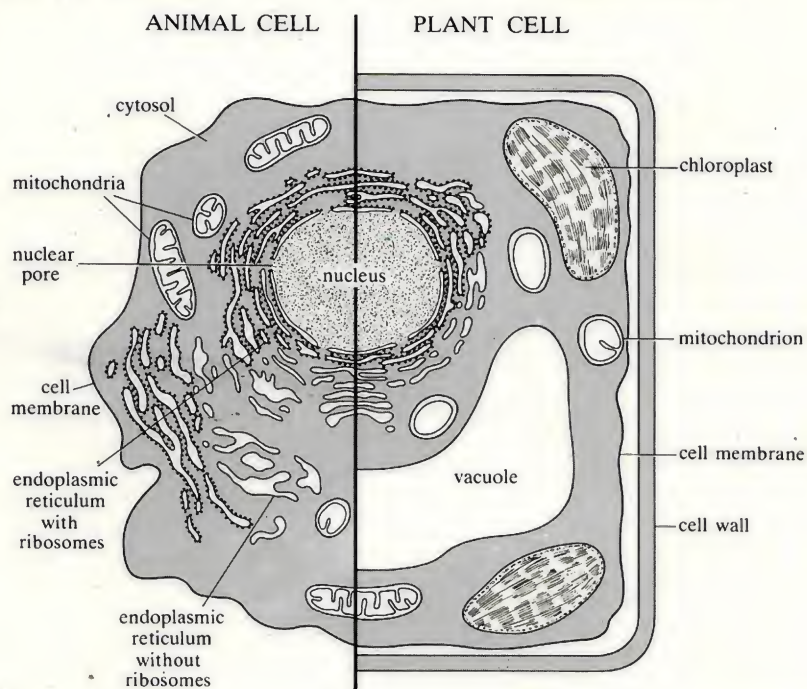
Unit 26
Biology reviewed

USEFUL INFORMATION FOR THE BIOLOGY UNITS: CHEMICALS, CELLS AND CLASSIFICATION

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S102 UNITS

1	Science and the planet Earth	19	Life and evolution
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3	Motion under gravity	21	Genes and evolution
4	Practical work in science	22	Biochemistry
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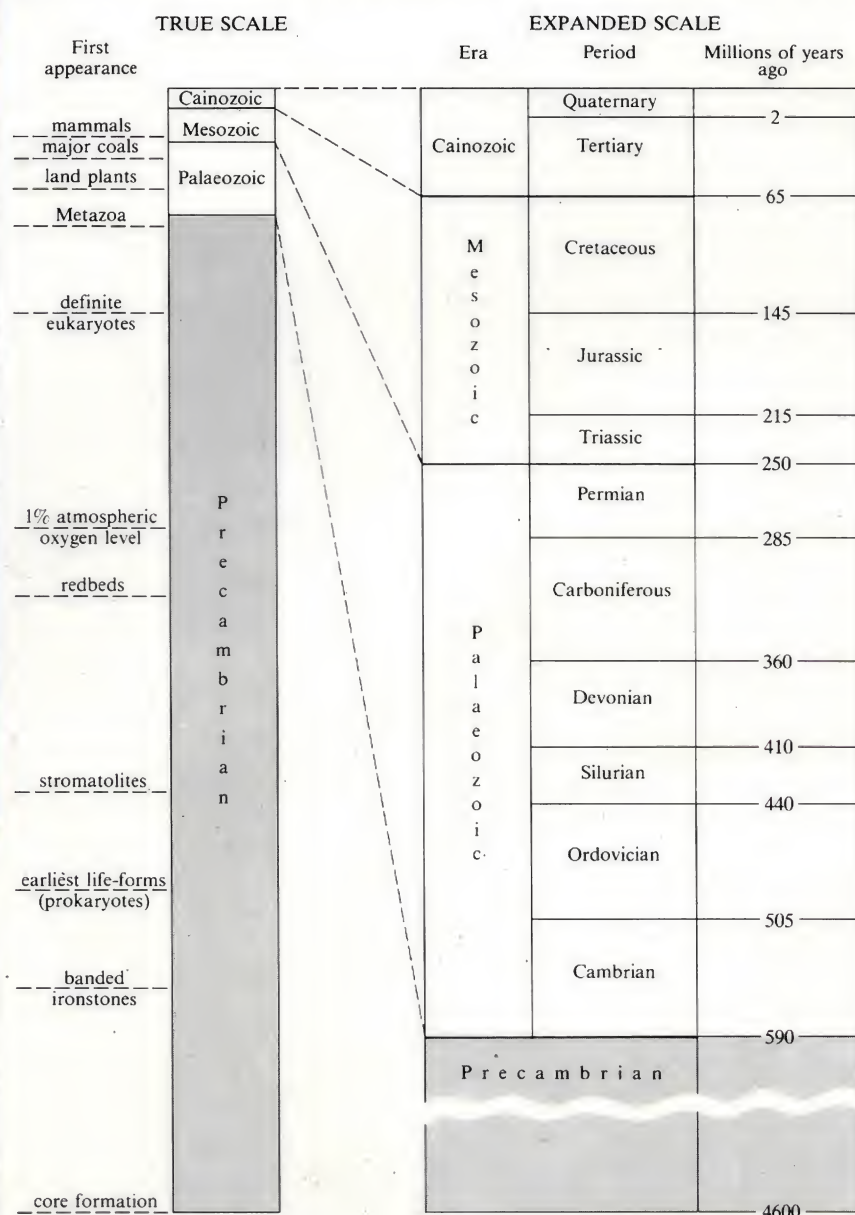
SCIENCE



Unit 27
Earth materials and processes

Units 28 – 29
Geological time and Earth history

EARTH HISTORY AND STRATIGRAPHIC COLUMN

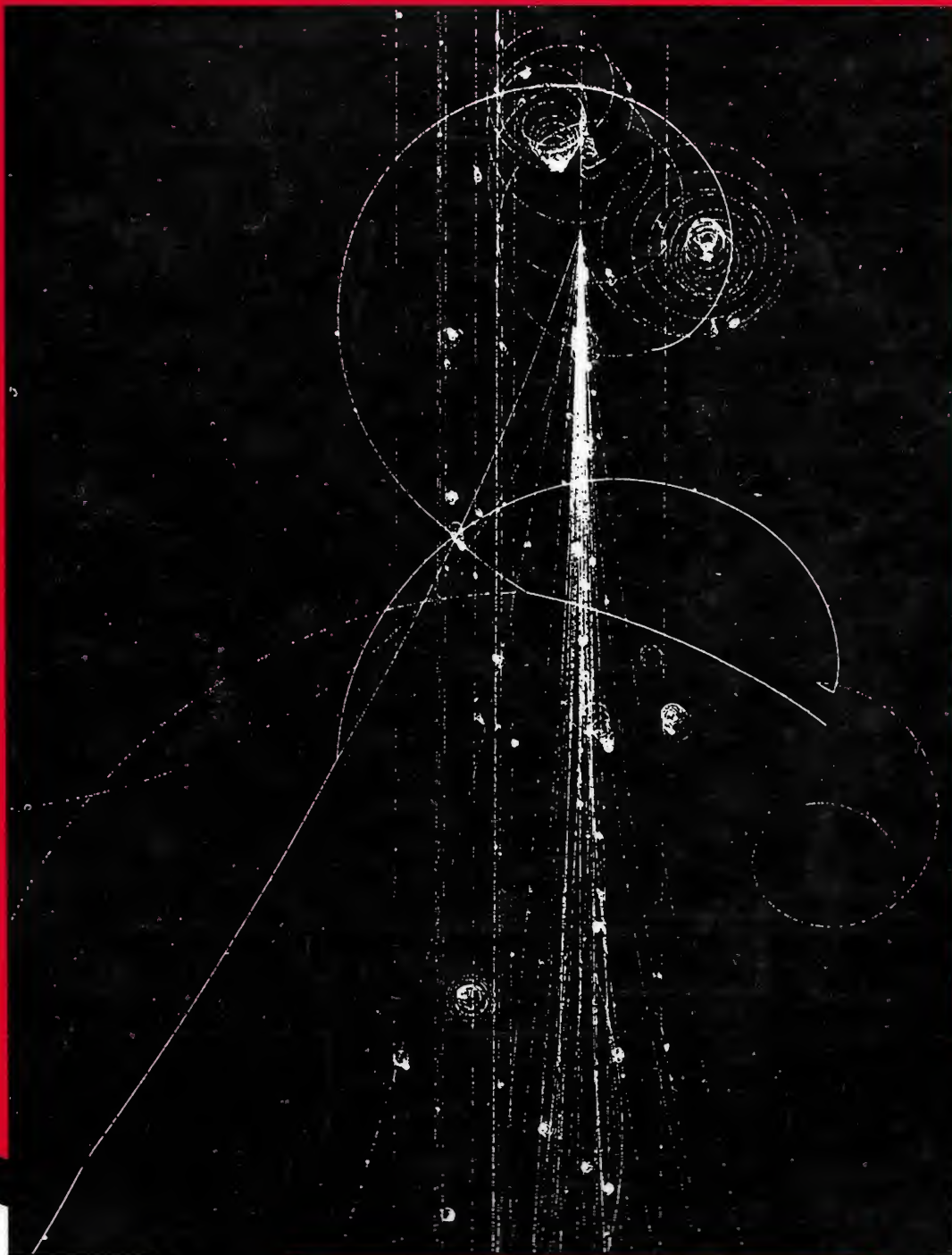


SI02 UNITS

1	Science and the planet Earth	19	Life and evolution
2	Measuring the Solar System	20	Inheritance and cell division
3	Motion under gravity	21	Genes and evolution
4	Practical work in science	22	Biochemistry
5-6	Into the Earth: earthquakes, seismology and the Earth's magnetism	23	Physiology
7-8	Plate tectonics: a revolution in the Earth sciences	24	DNA: molecular aspects of genetics
9	Energy	25	Ecology
10	Modelling the behaviour of light	26	Biology reviewed
11-12	Atomic structure	27	Earth materials and processes
13-14	Chemical reactions and the Periodic Table	28-29	Geological time and Earth history
15	Chemical equilibrium	30	Quantum mechanics: an introduction
16	Chemical energetics	31	Quantum mechanics: atoms and nuclei
17-18	The chemistry of carbon compounds	32	The search for fundamental particles



SCIENCE



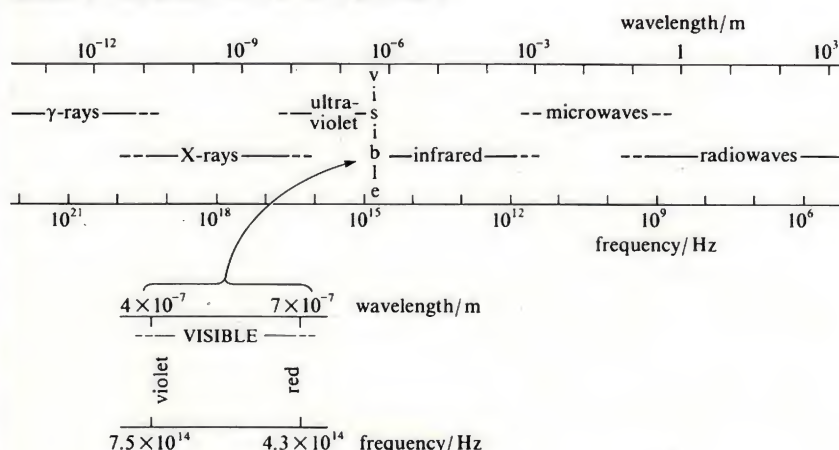
Unit 30
Quantum mechanics:
an introduction

Unit 31
Quantum mechanics:
atoms and nuclei

Unit 32
The search for fundamental particles

USEFUL INFORMATION FOR THE PHYSICS AND GENERAL SCIENCE UNITS

ELECTROMAGNETIC SPECTRUM



PHYSICAL CONSTANTS

Symbol	Quantity	Approximate value
G	gravitational constant	$6.672 \times 10^{-11} \text{ N m}^2 \text{ kg}^{-2}$
c	speed of light in a vacuum	$2.998 \times 10^8 \text{ m s}^{-1}$
h	Planck's constant	$6.626 \times 10^{-34} \text{ J s}$
e	magnitude of the charge of the electron	$1.602 \times 10^{-19} \text{ C}$
m_e	mass of the electron	$9.110 \times 10^{-31} \text{ kg}$
m_n	mass of the neutron	$1.675 \times 10^{-27} \text{ kg}$
m_p	mass of the proton	$1.673 \times 10^{-27} \text{ kg}$

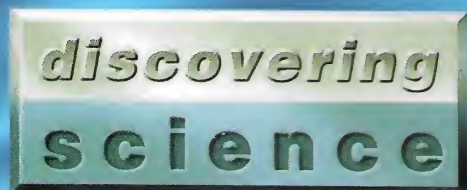
USEFUL QUANTITIES AND CONVERSIONS

$\pi \approx 3.142$	Earth radius (equatorial) $\approx 6.38 \times 10^6 \text{ m}$
1 mile $\approx 1.609 \text{ km}$	circumference of the Earth (distance round the Equator) $\approx 4.01 \times 10^7 \text{ m}$
1 kilometre (km) $\approx 0.6214 \text{ mile}$	radius of the Moon $\approx 1.74 \times 10^6 \text{ m}$
1 inch = 2.54 cm	radius of the Sun $\approx 6.96 \times 10^8 \text{ m}$
1 centimetre (cm) $\approx 0.3937 \text{ inch}$	Earth-Sun distance (i.e. orbital radius of the Earth) $\approx 1.50 \times 10^{11} \text{ m}$
1 kilocalorie $\approx 4187 \text{ J}$	Earth-Moon distance (i.e. orbital radius of the Moon) $\approx 3.84 \times 10^8 \text{ m}$
1 electronvolt (eV) $\approx 1.602 \times 10^{-19} \text{ J}$	
1 radian $\approx 57.296 \text{ degrees}$	
1 degree $\approx 0.01745 \text{ radian}$	
1 $\text{GeV}/c^2 \approx 1.783 \times 10^{-27} \text{ kg}$	

SI02 UNITS

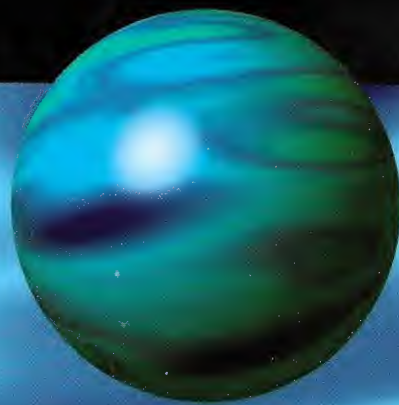
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17-18	The chemistry of carbon compounds		

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1 Water for life

- 1 Water for life**
- 2 A temperate Earth?**
- 3 The Earth and its place
in the Universe**
- 4 Unity within diversity**
- 5 Energy**
- 6 Our world and its atoms**
- 7 The quantum world**
- 8 Building with atoms**
- 9 Continuity and change**
- 10 Earth and life through time**
- 11 Universal processes**
- 12 Life in the Universe**



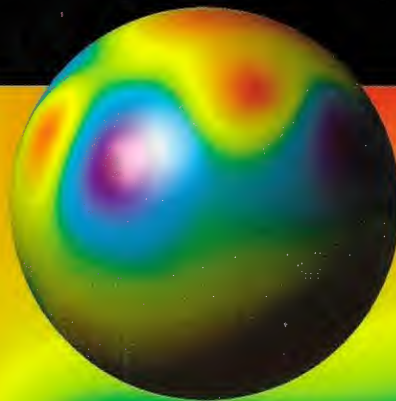
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2 A temperate Earth?

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- 2 A temperate Earth?**
- 3 The Earth and its place
in the Universe**
- 4 Unity within diversity**
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- 7 The quantum world**
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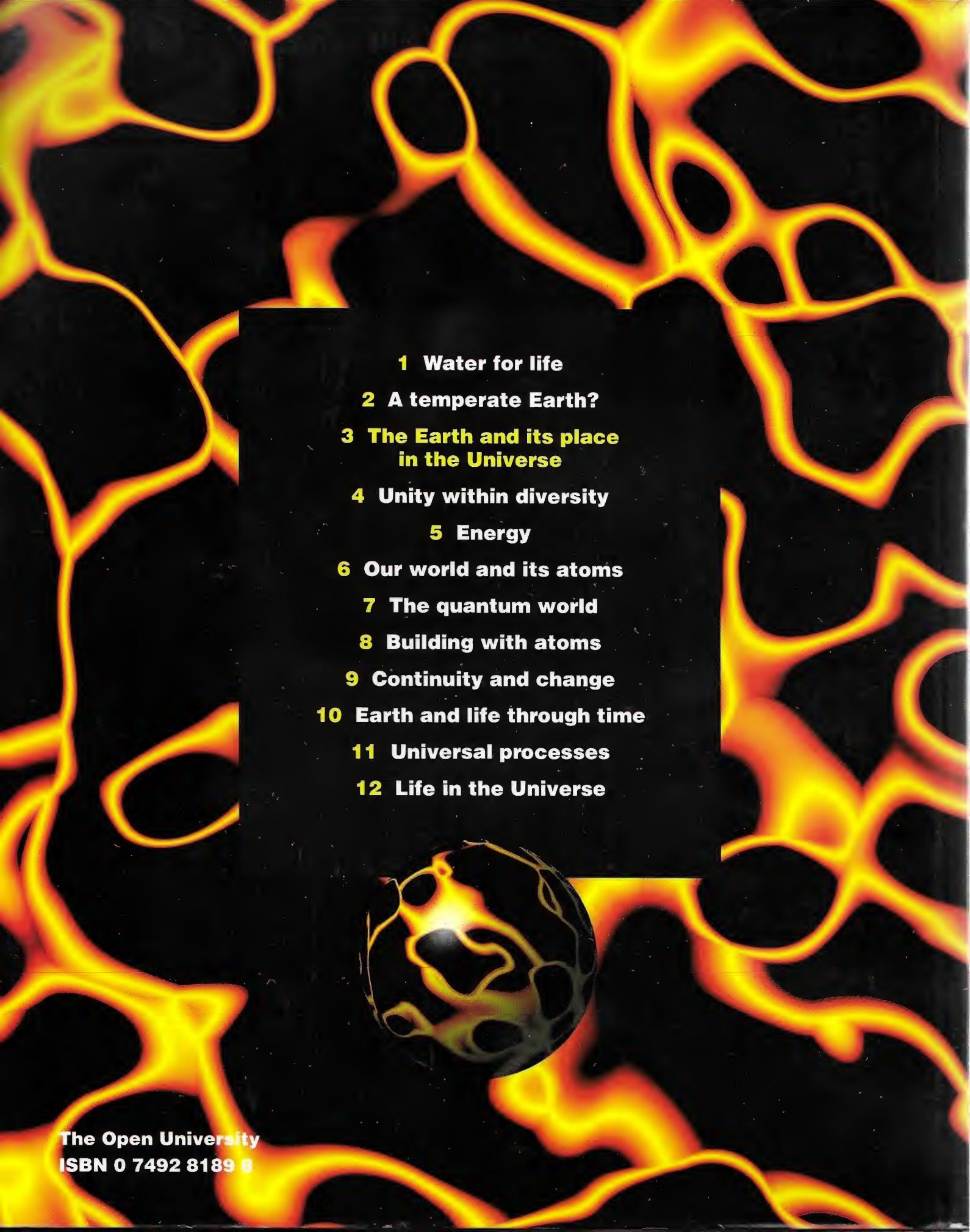

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**The Earth and its place in
the Universe**

3

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- 1 Water for life**
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in the Universe**
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Block 4
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Unity within diversity

4

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- 1 Water for life**
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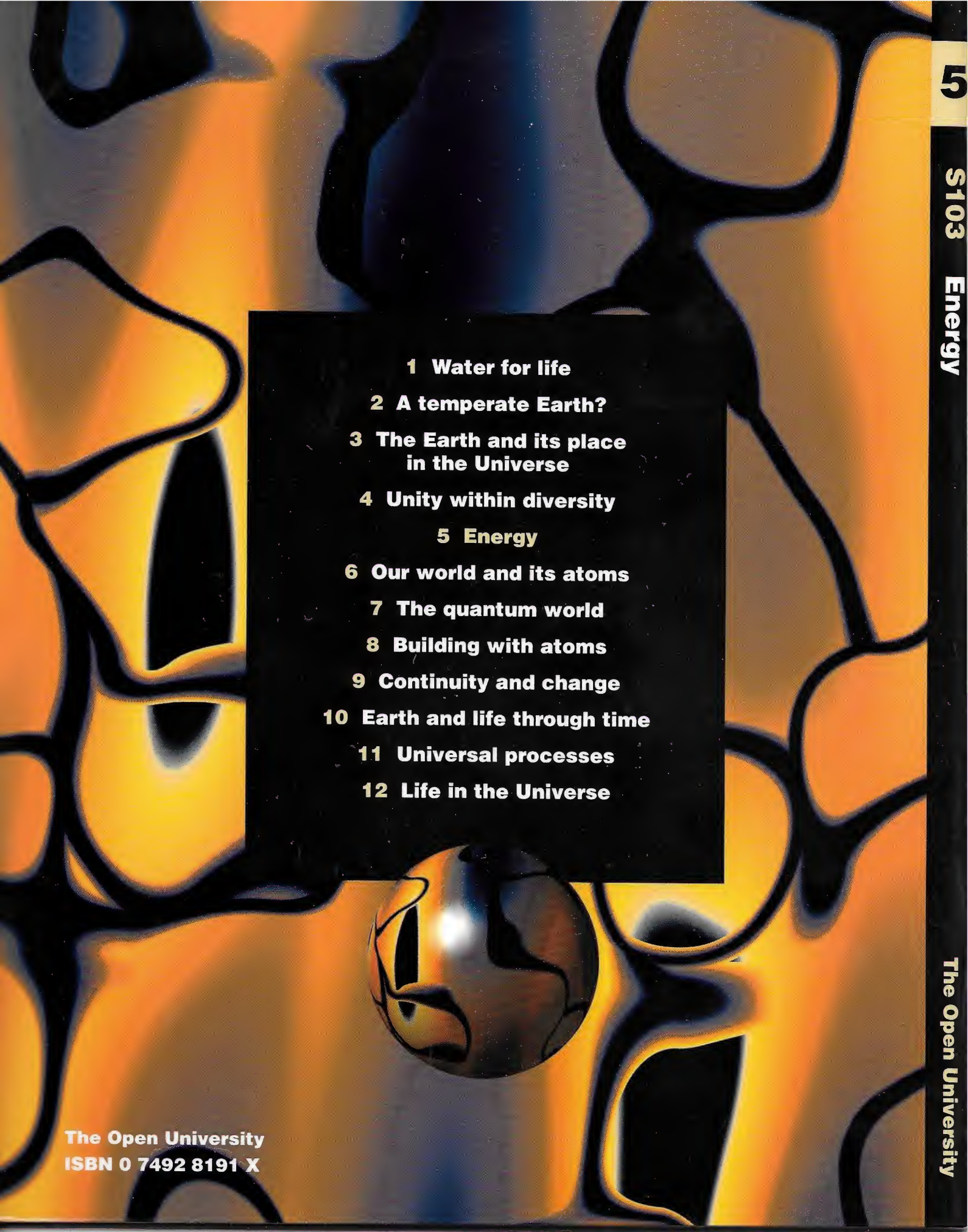
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5 Energy


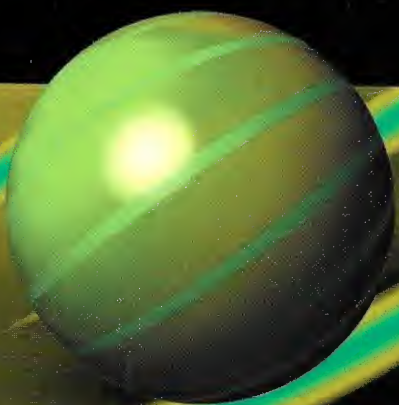
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Our world and its atoms

6

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- 
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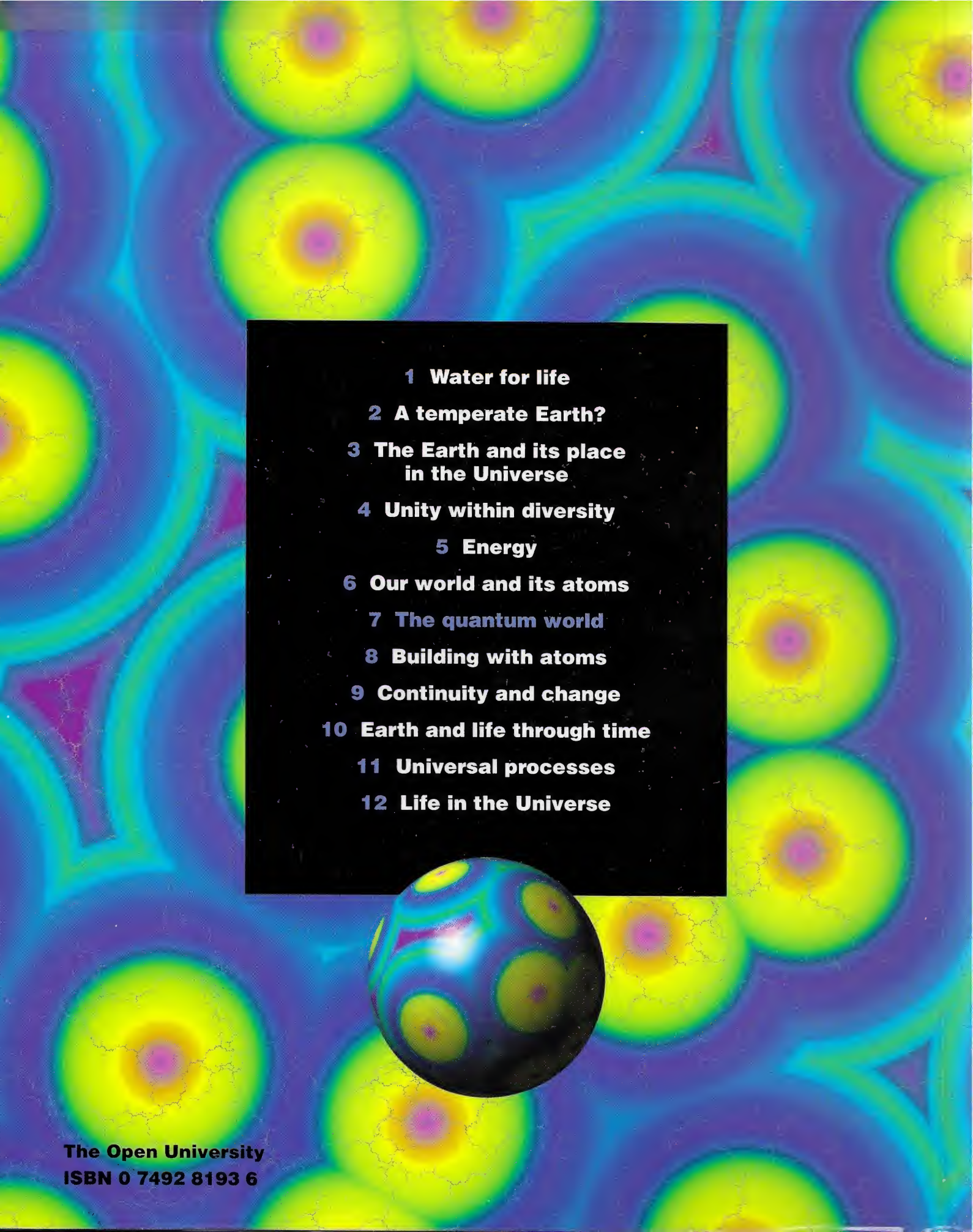
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The quantum world

7

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- The background of the entire page is a vibrant, abstract pattern of swirling colors, primarily purple, blue, and yellow, with some green and pink accents. The pattern resembles a complex, organic or cellular structure. In the center of the page, there is a black rectangular box containing a list of 12 items. Below this box, at the bottom center, is a 3D sphere with a similar swirling pattern to the background, but in shades of blue, purple, and yellow.
- 1 Water for life**
 - 2 A temperate Earth?**
 - 3 The Earth and its place in the Universe**
 - 4 Unity within diversity**
 - 5 Energy**
 - 6 Our world and its atoms**
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8 Building with atoms

- 
- 1 Water for life**
2 A temperate Earth?
**3 The Earth and its place
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4 Unity within diversity
5 Energy
6 Our world and its atoms
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8 Building with atoms
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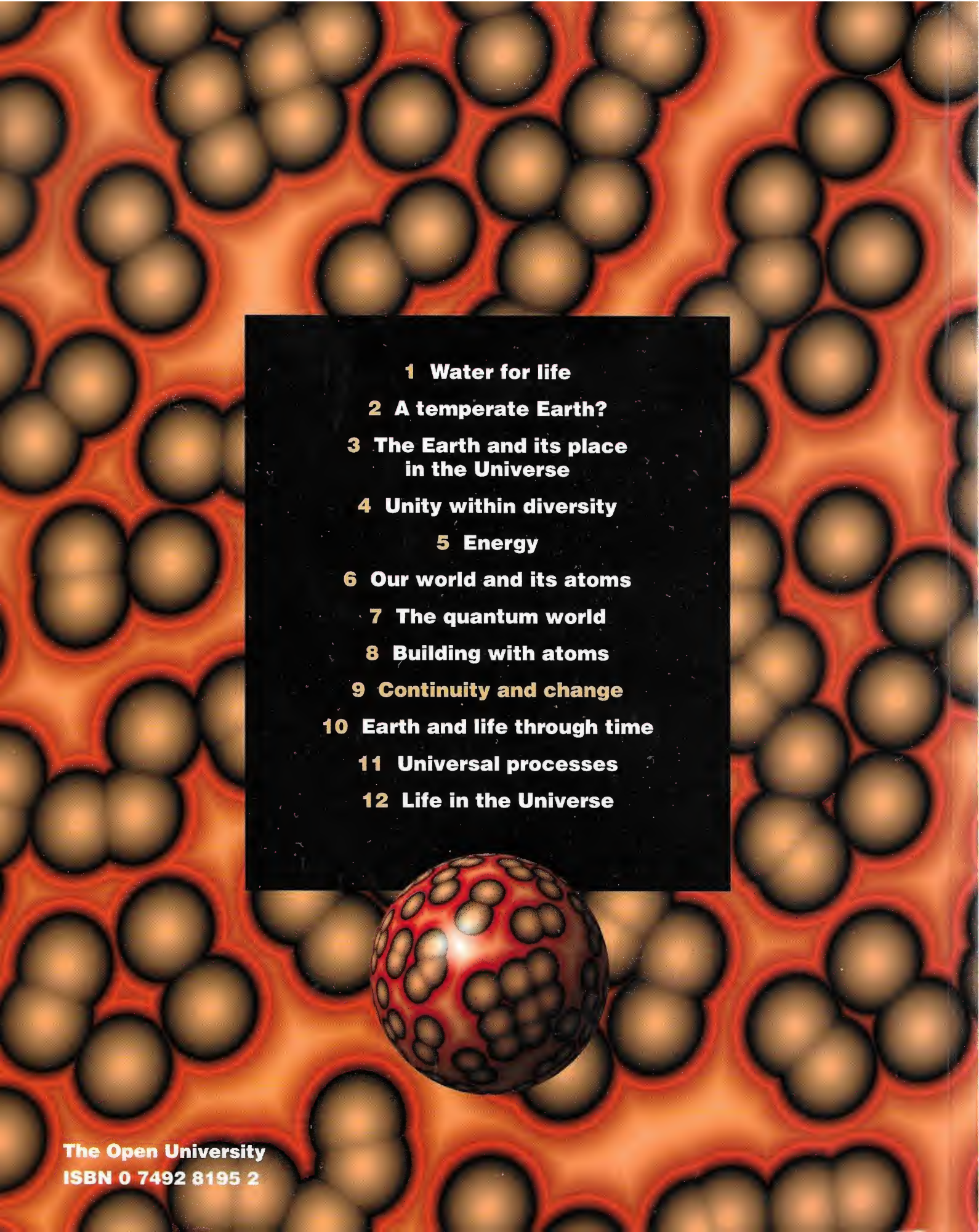



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9 Continuity and change

- 
- 
- 1 Water for life**
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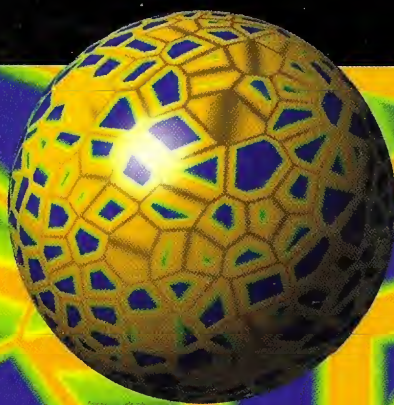
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Earth and life through time

10

- 1 Water for life**
- 2 A temperate Earth?**
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- 4 Unity within diversity**
- 5 Energy**
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- 7 The quantum world**
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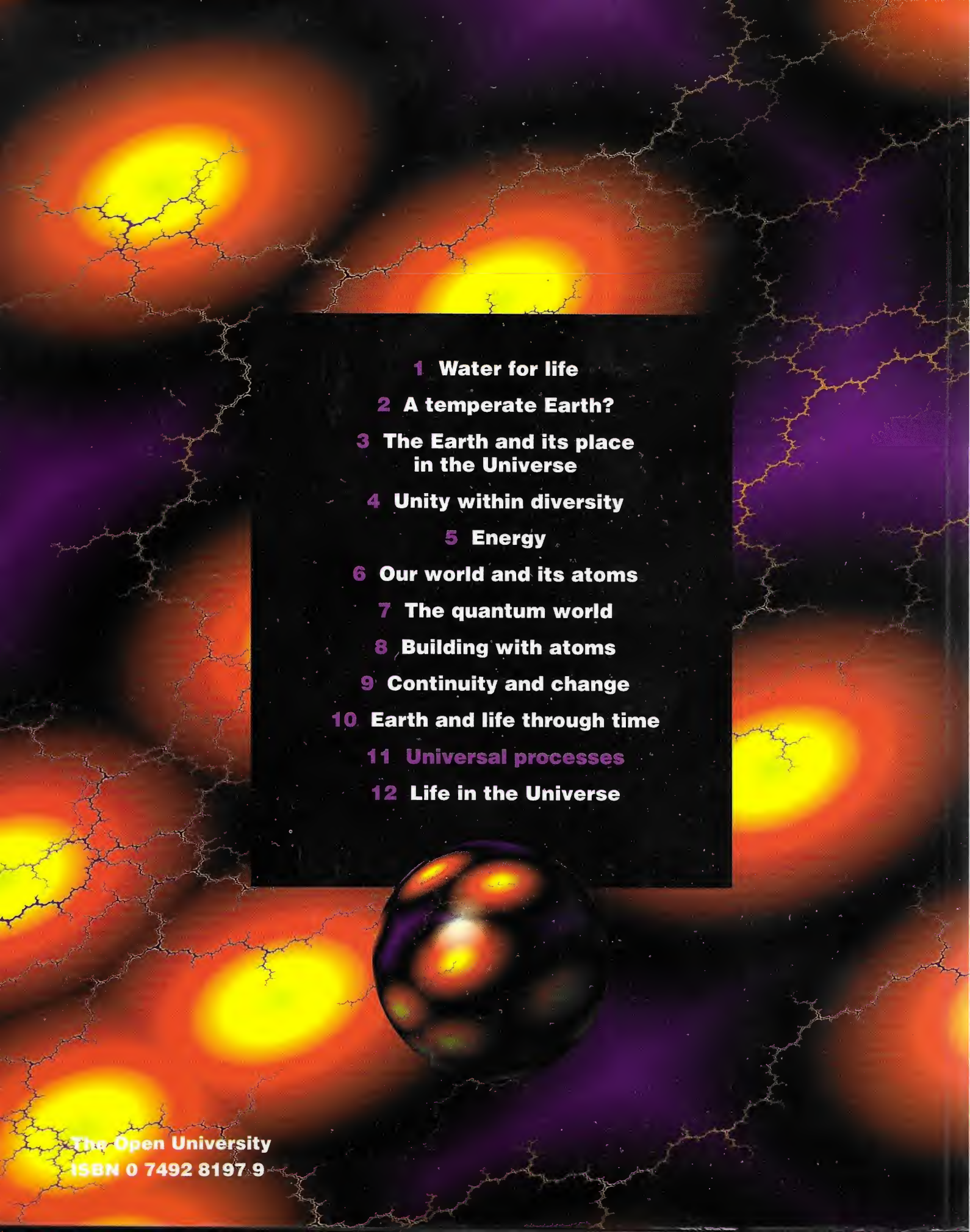
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Universal processes

11

- 
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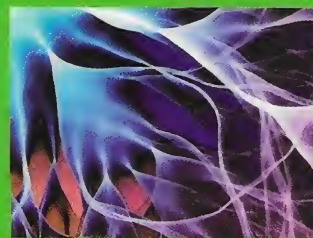


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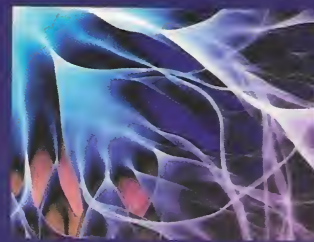
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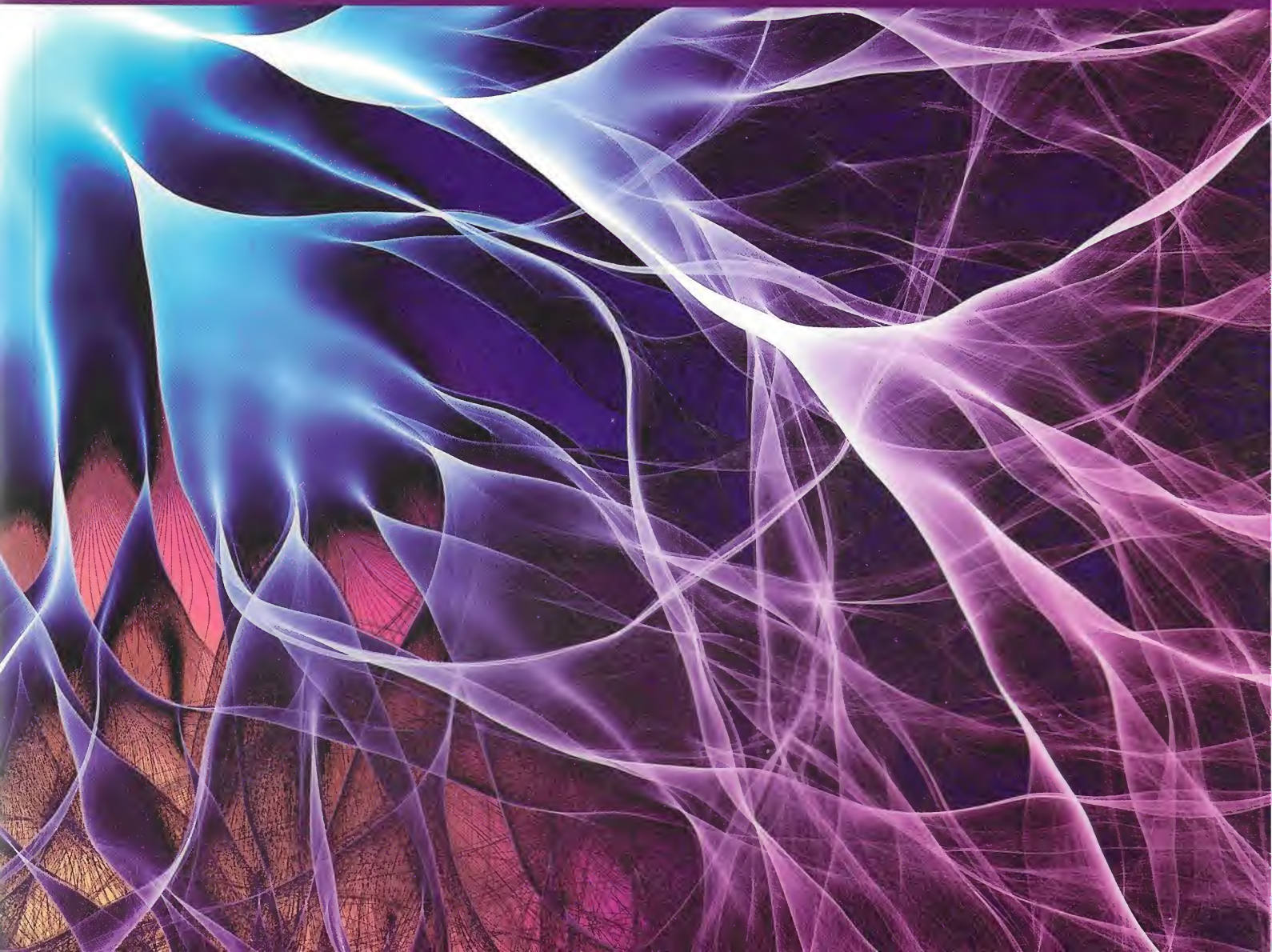
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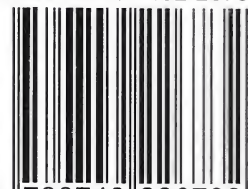


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